The Conductive Thermal Control Material Systems for Space Applications, Phase I

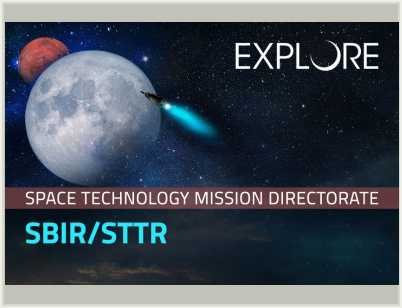
Completed Technology Project (2011 - 2011)

Project Introduction

This proposal is submitted to develop and demonstrate the feasibility of processing the space environment stable, multifunctional thermal control material system (TCMS) that can be applied to space hardware and can enables the hardware to carry higher leakage current through engineering the high electrical conductivity. An innovative space environmental stable TCMS is suggested through research & development work for the multifunctional, low (αS/εT) material systems that can meet these aggressive goals in cost effective, reliable manner. The suggested efforts emphasize developments in two material science areas: the first one considers the development of born nitride nano structure that includes nanotubes and nano mesh (BNNT-BNNM

TM

) and the second area proposes the synthesis and processing of various homologous compounds of Zinco-Indates that are recently identified as the high conductivity compounds with high refractive index. The material system that integrates these two technologies can allow higher leakage currents that may also help to defend against the natural solar storm events. The suggested TCMS have been derived from the available mathematical models for space craft charging that pay attention to the individual charge dissipation mechanisms and the molecular dynamics of the material systems as well as its thermodynamics. Thus the envisioned derived material systems can provide the needed reliable TCMS in typical space environments in (LEO), (GEO) & beyond. The reliability goal for the multifunctional conductive TCMS is to have a design life of > 10 years in LEO and > 15 years in GEO, and we anticipate the developments to mature by end of phase II ready for the hardware demonstration.



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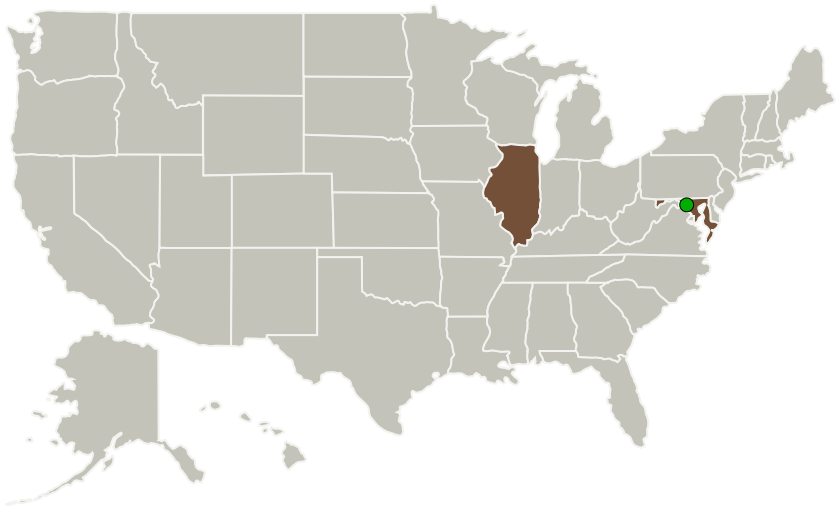
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Applied Material Systems Engineering, Inc. (AMSENG)	Lead Organization	Industry Small Disadvantaged Business (SDB)	Schaumburg, Illinois
Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations	
Illinois	Maryland

Project Transitions

February 2011: Project Start

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Applied Material Systems Engineering, Inc. (AMSENG)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

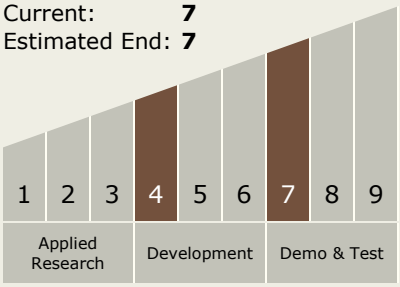
Carlos Torrez

Principal Investigator:

Mukund S Deshpande

Technology Maturity (TRL)

Start: **4**
Current: **7**
Estimated End: **7**



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September 2011: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/141820)*

Technology Areas

Primary:

- TX14 Thermal Management Systems
  - TX14.3 Thermal Protection Components and Systems
    - TX14.3.1 Thermal Protection Materials